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Advanced Experimental Setups for Investigation of Coherent Interactions of High-Energy Particle Beams with Crystals

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The last decade has seen a growing interest in the study of the passage of high energy charged particles in oriented or bent crystals. An increasing number of experiments on high energy beam lines are performed to investigate all the involved physical processes.

An experimental apparatus which includes different type of detectors run by a modular architecture data acquisition software is presented. It copes with all the requirements of a modern crystal/particle interaction experiment: high data acquisition rate, single particle tracking, emitted photon tagging and energy measurements, online monitoring and analysis tools and a full integration with motorized precision goniometers. The flexibility of the system makes it suitable for a wide spectrum of experiments.

In particular, the AXIAL and KLEVER 2017 and 2018 setups at the CERN North Area will be described. AXIAL studies axial and quasi-axial phenomena in crystals for beam steering and generation of intense electromagnetic radiation, while KLEVER focuses on pair production and radiation enhancement in straight crystals. Despite being different experiments with a large degree of complexity, they share the above described experimental apparatus which should also grant a prompt versatility.

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